

28th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Space Science Missions (2)

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PROJECT APTAS - USING CUBESAT DESIGN AND DEVELOPMENT TO BRING STUDENTS INTO NORTHERN SWEDEN'S SPACE ECOSYSTEM

Abstract

Project APTAS, Atmospheric Polar Transmission Alignment Satellite, is the first student satellite project at Luleå University of Technology (LTU). The goals of the project are to design, build, launch and operate a 1U CubeSat in a relatively short turnaround time, allowing participating students to partake in as much of the project as possible. The entire development of the project will take place at the Kiruna Space Campus close to the mountain Aptasvaara, the satellite's namesake. Our vision is to establish a recurring student satellite program in Kiruna and thereby strengthen LTU's position as a space university and the region's prominence as a contributor to the space sector as well as contribute to the already significant hands-on education for students. The Swedish Space Corporation's recent announcement of SmallSat launches to begin in 2022 from the nearby Esrange Space Center provides even more opportunities for local collaboration.

The project is an independent student initiative, with LTU and the Kempe Foundation providing financial support and two supervisors in an advisory role, as well as academic support. The project team consists of nearly 30 students. The two tracks of the Space Science and Technology master's program at LTU are Spacecraft and Instrumentation and Space and Atmospheric physics. APTAS allows students from both specializations to get practical experience within their preferred field working on the scientific or technical aspects of the satellite.

The satellite will carry two payload instruments that are being developed with the support of the EISCAT Scientific Association and the Onboard Space Systems group of the Department of Computer Science, Electrical and Space Engineering at LTU. The first will be a single-frequency transmitter which will act as a calibration tool for the new EISCAT 3D phased array antennas. The second will be a COTS Earth Observing camera performing scientific and technology objectives for atmospheric and geophysical research through remote sensing techniques. Launch is planned for Q1 2022. The satellite is going to be operated by an in-house ground station located in Kiruna.

The uniqueness of APTAS as a project lies in its ability to perform all stages of development locally whilst taking advantage of the proximity of world leading scientific institutes and companies. One of the main facilities is the university's state-of-the-art NanoSatellite Lab containing a clean room, ADCS testbed and other relevant AIT equipment in addition to a ground station.

This paper addresses mission overview, payloads, working process, and a technical description of the satellite.